

REMARKS

This amendment is in response to the Office Action dated December 145, 2005. By the present amendment, the claims have been amended to clarify the invention, as will be discussed below.

Briefly, the present invention is directed to provide a semiconductor non-volatile memory which includes a recording film that can store information based on a phase change material. In particular, as discussed in the Background of the Invention and the Summary of the Invention, previous non-volatile memories have been developed which use phase change films to record information based on the crystalline state of a memory element. Unfortunately, a problem which was encountered in such prior devices was that the recording film material is not sufficiently heat resistant for the memory to be used at high temperatures, for example those found in environments such as in automobiles. (e.g. see page 3, lines 6-17). Accordingly, the present invention is directed to providing an improved memory device using a recording film having a phase change material which can, in fact, operate at high temperatures, including those of 140° or higher (e.g. see the Abstract, lines 1-5).

To this end, the present invention, as defined by the present claims 1-10, provides a recording film which includes a particular combination of materials including: (1) a group consisting of Ge and Sb; (2) Te of 40 atom percent or more; and (3) at least one element selected from the elements in a 2b group, a 1b group, 3a to 7a groups and an 8 group of 20 atom percent to 50 atom percent. The fact that the content of Te is 40 atom percent or more is noted in the Abstract with the statement “in content of Te is 40 atom percent or more is used.” Also, on page 4, lines 1-3:

“Here, it is for the sake of keeping a high crystallization temperature that the phase change film includes Te of 40 atom percent or more.”

Thus, it is clear from the specification that the use of Te of 40 atom percent or more is an important feature of the recording film of the present invention to obtain the high temperature withstand capabilities of the present invention. Further discussion of this can be found on page 34, lines 5 et seq. which state:

If the content of Te is less than 40 atom percent, it is so difficult to render it a amorphous that it is no longer changed by less than 10 times of rewriting.”

Reconsideration and removal of the 35 U.S.C. §112 first and second paragraph rejections set forth on page 2 of the Office Action is respectfully requested. These rejections stem from the apparent contradiction due to the inappropriate location of the word “and” both in independent claims 1 and 8 as well as on page 3, line 24 of the specification. Specifically, the word “and” was used in each of those locations between the language describing a group consisting of Ge and Sb and the recitation of the amount of Te. Because of the use of the word “and” (for example, in claim 1, reciting “the group consisting of Ge and Sb, and Te of 40 atom percent or more,” it was not clearly indicated that the reference to 40 atom percent or more related to the amount of Te, not to a group consisting of Ge, Sb and Te. Therefore, this term “and” has been deleted at this location in claims 1 and 8, as well as on page 3, line 24, to thereby clarify the language of both the specification and the claims in this regard. With regard to this, as noted above, the Abstract

and the specification on page 4, lines 1-3 clearly sets forth that the original intention was that the amount of Te is 40 atom percent or more. Therefore, it is respectfully submitted that there is clear support for this correction in the original specification and Abstract and that no new matter is added by this change.

By virtue of these amendments, it is respectfully submitted that the 35 U.S.C. §112, first paragraph, rejection of the specification, concerning the lack of clear concise and exact terms is satisfied, as well as the contradiction between claim 1 and claim 3 noted in the 35 U.S.C. §112, second paragraph, rejection. Therefore, entry of these amendments to the specification and claims 1 and 8 and removal of both 35 U.S.C. §112, first and second paragraph rejections is respectfully requested.

With regard to the 35 U.S.C. §112, first paragraph, rejection, it is stated in the Office Action that "the specification is replete with terms which are not clear, concise and exact." However, no examples are provided. Reference is subsequently made in the rejection to "grammatical errors on every page." With regard to the terms which are not clear, concise and exact, other than the amendment to page 3 noted above, it is respectfully submitted that the other terminology used throughout the specification meets the requirements of 35 U.S.C. §112, first paragraph, even if the language includes some errors in grammar, punctuation, and/or syntax. It is respectfully submitted that such errors are of the minor nature and should be addressed in terms of an objection in the specification, rather than a rejection under 35 U.S.C. §112, first paragraph. With regard to this, Applicants are in the process of completing the preparation of a substitute specification which will attend to

correction of such minor grammatical errors, and they will submit this shortly by way of a supplemental amendment. In the meantime, reconsideration and removal of the 35 U.S.C. §112, first paragraph, is respectfully requested.

Finally, reconsideration and removal of the 35 U.S.C. §103(a) rejection of claims 1-10 as being unpatentable over Horie, '857 in view of Parkinson '413 is also respectfully requested. As noted above, by the present amendment to independent claims 1 and 8 it is clearly defined that the amount of Te is 40 atom percent or more in the recording film. It is respectfully submitted that neither Horie nor Parkinson teach or suggest a recording film with a content of Te of 40 atom percent or more. On the contrary, the primary reference to Horie contains Te of 10 atom percent or less. This is clear, for example, in paragraph 91 which states:

"Accordingly, the Te content is at most 10 atom percent."

Horie goes on to indicate that the amount "can be decreased to be less than 10 atom percent," and it appears, in general, that Horie prefers to use a smaller content of Te than 10 atom percent. In any event, absolutely nothing in Horie et al. teaches or suggest the use of Te at 40 atom percent or more. Similarly, nothing in Parkinson suggests the complete modification of Horie which would be required to meet this claim term.

The significance of this difference is that Horie's phase change recording film uses Sb of its main component. As such, this is a low resistance material. In the recording film of the Applicants memory device, on the other hand, because of the relatively high content of Te, a high resistance semiconductor film is provided. Therefore, not only is the structure of the present claimed invention different from Horie whether considered alone or in

combination with Parkinson, but the operational effects will also differ substantially. Accordingly, reconsideration and removal of the prior art rejection of the independent claims 1 and 8 and their respective dependent claims 2-7 and 9 and 10 over the combination of Horie and Parkinson is respectfully requested.

If the Examiner believes there are any matters which can clarified either by way of a personal or telephone interview, the Examiner is invited to contact Applicants undersigned attorney at the number indicated below.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (Case No. 500.43579X00) and please credit any excess fees to such deposit account.

Respectfully submitted,



Gregory E. Montone
Registration No. 28,141
ANTONELLI, TERRY, STOUT & KRAUS, LLP

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Attachments